

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 82304408.6

(51) Int. Cl.³: **B 29 C 17/07**
B 65 D 1/02

(22) Date of filing: 20.08.82

(30) Priority: 20.08.81 JP 123127/81 U
27.08.81 JP 134733/81

(43) Date of publication of application:
02.03.83 Bulletin 83/9

(84) Designated Contracting States:
CH DE FR GB IT LI NL

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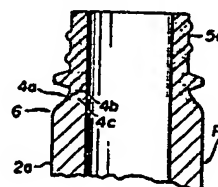
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(54) Blow-moulded bottle-shaped container of biaxially oriented polyethylene terephthalate resin and method of moulding the same.

(57) A hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate which advantageously has a crystallized outer peripheral portion at the neck portion except the boundary between the neck portion and the body portion and non-crystallized inner peripheral portion thereat. This bottle-shaped container is molded by a method of molding the same, which method advantageously has the steps of injection-molding a piece or parison formed at the outer peripheral surface of a neck root part forming portion in a downwardly flared tapered shape, and crystallizing by a heat treatment the outer peripheral surface portion of the neck root part forming portion except the entire area of the neck portion forming portion and the boundary portion therebetween. Thus, the deterioration in the physical properties of the neck and shoulder portions of the bottle-shaped container thus finally blow-molded can be reduced.

FIG.1



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This invention relates to a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin and a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin having a crystallized outer peripheral portion at the neck portion except the boundary between the neck portion and the body portion and non-crystallized inner peripheral portion thereat.

A blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin, hereinafter referred to as "a PET" has a wide range of application in a great deal of quantity due to its excellent physical properties and characteristics.

Some of excellent physical properties of a bottle-shaped container of a PET can be performed after the bottle-shaped container has been biaxially oriented and blow-molded. The bottle-shaped container of the PET has heretofore been produced due to the physical properties of the PET by the steps of injection-molding a piece or parison as a primary or prefabricated molded piece and then biaxially orienting the primary piece or parison, so-called an injection blow-molding method. Thus, the neck portion of the bottle-shaped container used as a mounting portion to a blowing mold has not entirely been oriented

but been molded from the primary piece or parison to the hollow blow-molded bottle-shaped container. In this manner, the shoulder portion continued to the neck portion of the bottle-shaped container has not thus been sufficiently oriented in the course of the injection blow-molding method but been blow-molded to the final bottle shape. Accordingly, the neck portion and the shoulder portion of the bottle-shaped container cannot perform the excellent physical properties of the PET prepared by being subjected to the biaxially blow-molded method.

The drawbacks and disadvantages of the bottle-shaped container of the final shape thus blow-molded at the neck portion and shoulder portions which have not been subjected to or sufficiently subjected to an orientation are, for example, a crazing which occurs due to the impregnation of alcohol in high density to the bottle-shaped container, a feasibility of various deformations and strains including elongation due to lack of sufficient hardness of the bottle-shaped container, and a low thermal resistance due to the occurrence of thermal deformation simply taken place in the case that a content liquid is filled at a high temperature in the bottle for the purpose of sterilization. More concretely, the neck portion and the shoulder portion of the conventional bottle-shaped container thus blow-molded has such drawbacks and disadvantages that, when high internal pressure is applied to the bottle-shaped container such as in the case that carbonated drink mixed with fruit juice is contained as a content liquid by a hot charging process, the shoulder portion molded without being subjected to sufficient orientation is axially elongated and deformed

by the internal pressure. - 3 -

Accordingly, an object of the present invention is to provide a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which can eliminate all the aforementioned drawbacks and disadvantages of the conventional bottle-shaped container and which has less deterioration in the physical properties of the neck portion and the shoulder portion including a neck root part.

Another object of the present invention is to provide a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which can eliminate all the aforementioned drawbacks and disadvantages of the conventional method of molding the bottle-shaped container of biaxially oriented polyethylene terephthalate resin and which can impart the same effects of orientation in the blow-molding as the body portion of the bottle-shaped container to the shoulder portion of the bottle-shaped container, thereby eliminating a crazing occurred due to the impregnation of alcohol in high density to the neck portion of the bottle-shaped container.

A further object of the present invention is to provide a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which can impart a sufficient hardness to the bottle-shaped container thus molded, thereby eliminating the apprehension of causing a permanent deformation of the neck

portion due to the clamping of a cap at the neck portion.

Still another object of the present invention is to provide a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which can improve the heat resistance of the bottle-shaped container thus molded.

Still another object of the invention is to provide a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which can eliminate various deformations such as the elongation of the shoulder portion due to high internal pressure acted to the interior of the bottle-shaped container.

According to a preferred aspect of the present invention, there is provided a method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin which comprises the steps of forming the outer peripheral surface of the neck root part forming portion disposed directly under the neck portion forming portion of a prefabricated piece or parison injection-molded in a downwardly flared tapered shape in such a manner that the thickness of the body portion forming portion is larger than that of the neck root part forming portion of the piece or parison prior to the biaxial-orientation blow-molding step, heat treating the outer peripheral surface of the neck root part forming portion and the neck portion forming portion of the piece or parison to crystallize the same, and biaxial-orientation blow-molding the piece or parison into a bottle-shaped container of a biaxially oriented polyethylene terephthalate resin.

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The above and other related objects and features of the invention will be apparent from a reading of the following description of the disclosure found in the accompanying drawings and the novelty thereof pointed out in the appended claims.

Fig. 1 is a partially longitudinal sectional view of an injection-molded piece or parison before being biaxial-orientation blow-molded to be performed of a method of molding a hollow blow-molded bottle-shaped container according to the present invention;

Fig. 2 is a partially longitudinal sectional view of a bottle-shaped container blow-molded according to the method of the present invention; and

Fig. 3 is a partially longitudinal sectional view of a bottle-shaped container in which the portion from the neck root part to the intermediate part of the shoulder portion is crystallized according to the method of the present invention

The present invention will now be described in more detail with reference to the accompanying drawings.

A method of molding a hollow blow-molded container of a biaxially oriented polyethylene terephthalate according to the present invention biaxial-orientation blow-molds a piece or parison P injection-molded as a preformed primary molded piece or parison into a bottle-shaped container 1.

The piece or parison P to be performed of the method of the present invention is formed, as shown in Fig. 1, in a downwardly flared tapered shape at the neck root part forming portion 4a disposed directly under a neck portion forming portion 5a in such a structure that the thickness of the neck root part forming portion 4a is sufficiently smaller than that of the body portion forming portion 2a.

The outer peripheral surface of the neck root part forming portion 4a thus formed in a downwardly flared tapered shape is formed in the same shape as the outer peripheral surface of the portion of the bottle-shaped container 1 to be produced by biaxial-orientation blow-molding the piece or parison P and hence the neck root part 4 of the bottle-shaped container 1.

According to the method of the present invention, the piece or parison P thus formed in such a structure described above is heat treated at the entire area of the neck portion forming portion 5a and the outer peripheral surface of the neck root part forming portion 4a to be thus crystallized prior to the biaxial-orientation blow-molding of the piece or parison P.

It should be noted in this case that the outer peripheral surface of the neck root part forming portion 4a becoming a curved portion to be crystallized may not reach a boundary portion 6 between the outer peripheral surface of the neck root part forming portion 4a and the body portion forming portion 2a.

This is because, if the boundary portion 6 becomes the part not to be oriented and deformed.

After the entire area of the neck portion forming

portion 5a and the outer peripheral surface 4b of the neck root part forming portion 4a are crystallized in this manner, the piece or parison P is heated to a temperature allowing an orientation effect for the piece or parison P, is then mounted via the neck portion forming portion 5a in a blowing mold, and is biaxial-orientation blow-molded into a bottle-shaped container 1.

The biaxial-orientation blow-molding of the piece or parison P into a bottle-shaped container 1 is performed in the same manner as the conventional blow-molding, but the deformed states of the respective portions of the piece or parison P, particularly the neck root part 4 and the biaxial-orientation blow-molding are largely different from those carried out according to the conventional blow-molding by the process that the outer peripheral surface of the neck root part forming portion 4a is crystallized and the thickness of the neck root part forming portion 4a is smaller than that of the body portion forming portion 2a.

More particularly, the orienting deformation of the piece or parison P is concentrated to the thinner portion of the piece or parison P to cause the thinner portion to be deformed to a predetermined elongation quantity much earlier. Therefore, when the piece or parison P is blow-molded by biaxial orientation into a bottle-shaped container 1, the elongation deformation is concentrated at the neck root part forming portion 4a thus formed in a thin thickness at the initial time of the orientation blow-molding.

However, since the outer peripheral surface of the neck root part forming portion 4a of the piece or parison

P₁ has already crystallized to become a part not to be orientation-deformed, only the inside portion 4c of the neck root part forming portion 4a which has not crystallized is orientation-deformed upon orientation-deforming of the body portion forming portion 2a in such a state to be moved to the body portion forming portion 2a side, thereby forming substantially the shoulder portion 3 of the bottle-shaped container 1.

When the neck root part forming portion 4a of the piece or parison P₁ is orientation-deformed in the blowing-mold, only the outer peripheral surface of the neck portion forming portion 5a and the outer peripheral surface of the neck root part forming portion 4a, i.e., the portions already crystallized are contacted with the blowing-mold but the other portions are not contacted with the blowing-mold. Therefore, the cooling effect from the blowing-mold at the initial time of the orientation-deforming does not substantially affect the portion not crystallized and hence the outer peripheral surface not crystallized of the neck root part forming portion 4a of the neck portion forming portion 5a, thereby extremely smoothly performing the orientation deformation of the neck root part forming portion 4a not crystallized.

In this manner, the neck root part forming portion 4a of the neck portion forming portion 5a of the piece or parison P₁ can be sufficiently orientation-deformed except the outer peripheral surface 4b not crystallized in the blow-molding. Accordingly, as evident from Fig. 2, the neck root part 4 is formed substantially at the outer peripheral surface 4b crystallized of the neck part forming

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portion 4a in the orientation blow-molding, the shoulder portion 3 integrally continued to the neck root part 4 of the neck portion 5 is molded at the outer peripheral surface already crystallized of the neck root part forming portion 4a, and the shoulder portion 3 integrally continued to the neck root part 4 is blow-molded in such a manner that the inside portion 4c not crystallized of the neck root part forming portion 4a is orientation blow-molded. Therefore, the shoulder portion 3 integrally continued to the neck root part 4 can be sufficiently oriented and can be formed in the thickness equivalent to the body portion 2 of the bottle-shaped container 1.

Therefore, the bottle-shaped container 1 thus biaxial-orientation blow-molded is blow-molded by crystallizing the neck portion 5 forming a part of the bottle-shaped container 1 not entirely oriented from the piece or parison P and the neck root part 4 forming a part of the bottle-shaped container 1 substantially not oriented nor deformed, and the shoulder portion 3 not heretofore sufficiently oriented and blow-molded can also be sufficiently orientation-deformed.

Fig. 3 shows a bottle-shaped container, in which the portion from the neck root part 4 to the intermediate part of the shoulder portion 3 is substantially crystallized according to the present invention. In order to blow-mold this bottle-shaped container according to the method of the present invention, the crystallization step performed at the neck root part forming portion 4a of the piece or parison P extends further to the boundary portion 6 as compared from the state shown in Fig. 1.

It should be appreciated from the foregoing description

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that since the method of molding the hollow-blow-molded bottle-shaped container of the present invention previously crystallizes the neck portion 5 blow-molded into final shape without substantially entirely orientation-deformed and the neck root part 4 blow-molded into final shape without substantially orientation-deformed, thereby sufficiently orientation-deforming the shoulder portion 3 not sufficiently blow-molded to the final shape without heretofore sufficiently orientation-deformed, it can impart the effect by the orientation equivalent to the body portion 2 to the shoulder portion 3, can thus prevent the crazing caused by the alcohol in high density at the neck portion 5, can provide sufficient hardness to the bottle-shaped container, thereby allowing no apprehension of causing the permanent deformation upon clamping of a cap at the neck portion, can improve the heat resistance of the bottle-shaped container and can also prevent the various deformations such as the elongation of the shoulder portion 3 due to the high internal pressure acted to the interior of the bottle-shaped container thus blow-molded.

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CLAIMS

1. A method of molding a hollow blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin characterised by:

(a) injection-molding a piece or parison of primary preformed shape formed at the outer peripheral surface of a neck root part forming portion directly under a neck portion forming portion in a downwardly flared tapered shape,

(b) crystallizing by a heat treatment the outer peripheral surface portion of said neck root part forming portion except the entire area of said neck portion forming portion and the boundary portion between the neck portion forming portion and a body portion forming portion, and then

(c) biaxial-orientation blow-molding other portion than said crystallized portion thus formed of the piece or parison P into a bottle-shaped container.

2. The method according to claim 1, wherein the neck root part forming portion of said piece or parison is crystallized at the outer peripheral surface portion, the inside portion thereof is not crystallized, and the shoulder portion integrally continued to the neck root part forming portion is oriented at the inside portion of the neck root part forming portion at the time of biaxial-orientation blow-molding.

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3. The method according to claim 2, wherein the shoulder portion is oriented in thickness equivalently to the body portion.

4. A hollow-blow-molded bottle-shaped container of a biaxially oriented polyethylene terephthalate resin characterised by:

- (a) a cylindrical body with a bottom,
- (b) a neck portion blow-molded from a piece or parison injection-molded in a shape formed at the outer peripheral surface of a neck root part forming portion directly under a neck portion forming portion in a downwardly flared tapered shape, also formed at the outer peripheral surface portion of said neck root part forming portion except the entire area of said neck portion forming portion and a boundary portion between the neck portion forming portion and a body portion forming portion crystallized by a heat treatment and not crystallized at the inside portion thereof, and
- (c) a shoulder portion blow-molded from a shoulder portion forming portion of said piece or parison injection-molded in a shape formed at the inside portion of said neck portion forming portion oriented.

5. The hollow blow-molded bottle-shaped container according to claim 4, wherein the thickness of the neck root part forming portion of said piece or parison is smaller than that of said body portion forming portion.

6. The hollow blow-molded bottle-shaped container according to claim 4, wherein the outer peripheral surface of the neck root part forming portion formed in said downwardly flared tapered shape is entirely the same as the outer peripheral surface of the neck portion of said blow-molded bottle-shaped container.

7. The hollow blow-molded bottle-shaped container according to claim 4, wherein said shoulder portion comprises a crystallized portion and a non-crystallized portion.

FIG.1

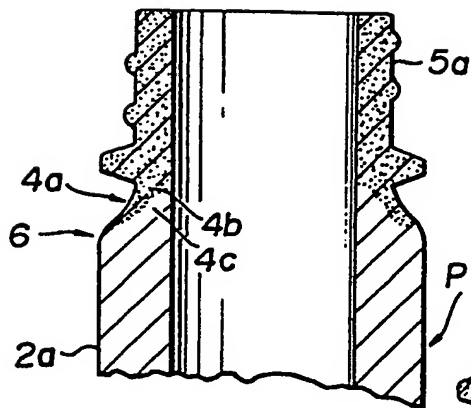


FIG.2

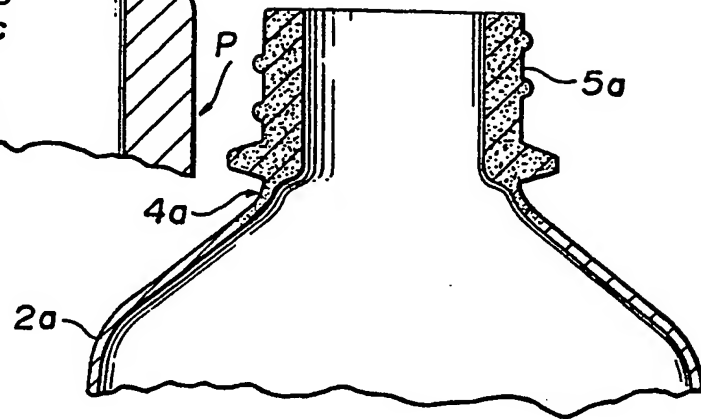
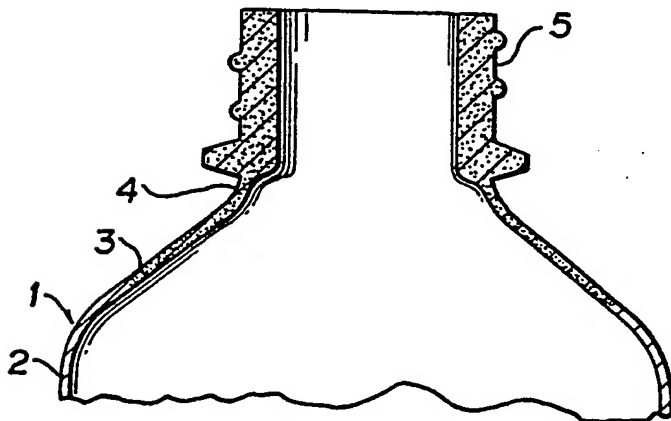


FIG.3



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